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FABRIC CARE COMPOSITION FOR DIRECTLY APPLYING TO FABRICS

FIELD

The present invention relates to fabric care compositions. Specifically, the present invention relates to fabric care compositions for use during ironing.

BACKGROUND

Fabric softening actives are known to be added to laundry applications in order to provide softer fabrics, to reduce or eliminate static, to reduce or eliminate wrinkles and to enhance in-wear comfort. Traditionally, such fabric softening actives have been used to provide benefits on fabrics such as clothes. These fabric softening actives are typically added in either the wash cycle as part of the detergent, or separately in the rinse and/or drying cycles of a laundering operation. Thus, during the wash, rinse, and/or drying cycles, these fabric softening actives transfer (e.g., from solution or a dryer sheet) onto clothes, to provide one or more of the above benefits. However, as not all of the fabric softening active is transferred onto the fabric(s), it is desirable to increase the fabric softening active's efficiency of deposition to as high a level as possible. This would allow formulators to lower formulation costs and yet provide the same level of benefits to the consumer.

Furthermore, for a variety of reasons, such a fabric care process does not necessarily result in wrinkle-free clothes. For example, such clothes, if left in the dryer, or if stored for too long before folding and/or hanging, will develop wrinkles. Thus, clothes may require additional processing in order to reduce wrinkles. Ironing is a common method for reducing wrinkles in fabrics and in already-laundered clothes. Starch-containing ironing compositions and methods for utilizing them are well-known in the art for reducing wrinkles in fabrics, and for shape-retention. However, they suffer from certain drawbacks. For example, starches may easily burn and turn a dark color when ironed, leaving a darkened

mark on clothes. Such darkened marks may be difficult, if not impossible to remove from the fabric. Furthermore, although ironing with starch reduces wrinkles, it does so by making the fabric fibers hard and stiff. Certain consumers do not like such stiff fabrics and clothes, because they often feel scratchy. Thus, treatment with a starch-containing ironing composition may reduce, or even eliminate one or more of the benefits (e.g., softness) conferred by a previously-used fabric softening active (e.g., previously used in the rinse cycle). Starch also tends to make colors less vivid by interfering with light transmission. This is undesirable, as the consumer's eye interprets it as a fading of the fabric's colors.

Starch-free ironing compositions and methods for utilizing them are also known. Typically, such ironing compositions contain one or more compounds, such as silicone, which interact and/or coat the fabric fibers to facilitate the ironing by reducing drag, and reducing the tendency of wrinkles to reform. Typically, such silicone-containing ironing compositions form covalent silicon-oxygen linkages to form higher molecular weight silicone-containing polymers. Such compositions may also provide shape-retention benefits as well. However, silicone also possesses certain disadvantages. For example, silicone is typically more expensive than most of the other ingredients in a fabric care composition. Additionally, silicone, being an oil, is usually unstable in a dilute solution, and easily phase-separates over time, such as during long-term storage.

Accordingly, the need remains for an improved and more efficient method for directly depositing a fabric softening active onto a fabric. The need also remains for a method for reducing wrinkles, which does not reduce or eliminate the benefits conferred by a previously-used fabric softening active. The need also remains for a stable, less expensive ironing composition which provides easy ironing, reduces wrinkles, and provides soft clothes rather than stiff clothes.

SUMMARY OF THE INVENTION

It has now been found that when directly applied onto a fabric, a fabric care composition may provide one or more benefits such as softer clothes, reduced static, easier ironing, improved shape retention, wrinkle reduction, a reduced likelihood of leaving darkened marks, and better in-wear comfort. Such a fabric care composition contains therein a fabric softening active, and is applied directly onto a fabric which is then preferably ironed. It has now been found that with such a method of use, the efficiency of deposition of the fabric softening

active onto the fabric is extremely high and the benefit can be selectively increased for those items that are most prone to wrinkle. It has also now been found that such an efficient method of depositing the fabric softening active onto the target fabric provides significant benefits as further discussed herein.

The present invention relates to a fabric care composition containing from about 0.01% to about 1% fabric softening active by weight, a solvent, and the balance adjunct materials. The fabric care composition is substantially free of starch, and substantially free of silicone.

The present invention also relates to a fabric care method having the steps of providing the fabric care composition described above, applying the fabric care composition directly onto a fabric, and ironing the fabric.

The present invention also relates to a fabric care kit containing a container having a hollow body member having at least one reservoir. At least one application mechanism is in connected relation to the reservoir, and the reservoir contains the fabric care composition described above.

The present invention also relates to a fabric care method having the steps of providing a concentrated fabric care composition, providing a dilution solvent, diluting the concentrated fabric care composition with the dilution solvent to form a fabric care composition, applying the fabric care composition directly onto a fabric, and ironing the fabric. The concentrated fabric care composition contains from about 1% to about 75% fabric softening active by weight, a solvent, and the balance adjunct materials. The concentrated fabric care composition is diluted with the dilution solvent at a dilution ratio of from about 1:1 to about 1:100. The fabric care composition is substantially free of starch.

The present invention also relates to a concentrated fabric care kit comprising a hollow body member, dilution instructions, application instructions, and ironing instructions. The hollow body member has at least one reservoir containing a concentrated fabric care composition containing from about 1% to about 75% of a fabric softening active by weight, a solvent, and the balance adjunct materials. When the concentrated fabric care composition is diluted according to the dilution instructions, it forms a fabric care composition which is substantially free of starch.

These and other features, aspects, and advantages of the present invention will become evident to those skilled in the art from a reading of the present disclosure with the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with the present invention it has been found that when directly applied onto a fabric, a fabric care composition may provide one or more benefits such as wrinkle reduction, easier ironing, shape retention, static removal, and in-wear comfort, without reducing or eliminating the benefits conferred by a previously-used fabric softening active. Furthermore, it has now been found that when the fabric care composition is sprayed directly onto the fabric, the efficiency of deposition is extremely high, with virtually all of the fabric softening active being transferred to the fabric. This permits the use of more water-soluble actives that are desirable for rewetting of the fabric and/or easy stain removal as well as other desirable benefits such as germ growth prevention, malodor removal, etc. Furthermore, by direct application, more fabric softening active can be used for those fabrics that require more active, or which are more prone to wrinkling. Accordingly, with such direct application, less fabric softening active is wasted, and thus the level of fabric softening active in the fabric care composition may be significantly lower, and yet provide the same, or improved benefits. The present invention also allows a consumer to selectively treat specific garments, as desired, rather than treating the whole wash load. As an added benefit, this may also lower overall formulation costs for the fabric care composition, while providing performance which is equal to or better than that of other applications, as well as making the ironing task easier due to wrinkle reduction, wetting of fabrics, and friction reduction.

All percentages, ratios and proportions herein are by weight of the fabric care composition, unless otherwise specified. All temperatures are in degrees Celsius (°C) unless otherwise specified. All documents cited are incorporated herein by reference.

As used herein, the term "alkyl" means a hydrocarbyl moiety which is straight or branched, saturated or unsaturated. Unless otherwise specified, alkyl moieties are preferably saturated or unsaturated with double bonds, preferably with one or two double bonds. Included in the term "alkyl" is the alkyl portion of acyl groups.

The term "efficiency of deposition" refers to the percent of fabric softening active used, which is actually deposited upon the fabric being treated. Such percentages may be calculated, for example, by measuring the amount of fabric

softening active actually deposited and dividing by the total amount of fabric softening active used. Alternatively, such percentages may be calculated by measuring the percentage of fabric softening active which is not deposited upon the fabric, and subtracting this from 100%.

The term "ironing" as used herein refers to treating clothes to reduce or eliminate wrinkles, by, for example, ironing, pressing, steaming, and combinations thereof.

The term "previously-used fabric softening active" as used herein refers to a fabric softening active which has been used in a step (of a laundering operation) prior to when the fabric care composition of the present invention is directly applied onto the fabric. The previously-used fabric softening active may be applied, for example, in the wash cycle, in the rinse cycle, and/or in the drying cycle.

The term "shape retention" as used herein means that a fabric treated with the fabric care composition/method/kit described herein is less likely to wrinkle or lose its ironed shape than a comparable, non-treated fabric.

The term "starch" as used herein includes both natural and artificial starches, as well as the classes of starches commonly known as "modified starches", and the so called "cellulosic derivatives".

The term "substantially free of" as used herein indicates that although the referred-to-materials may be present, for example, as contaminants in minor amounts, none of these materials are intentionally added as ingredients to the composition in an amount which is sufficient to provide an effective cleaning, ironing, or fabric softening benefit.

The present invention is directed towards a fabric care composition, a method for using the fabric care composition, and a fabric care kit containing the fabric care composition. Thus, the "fabric care composition", as described herein indicates a composition which is ready to apply directly onto a fabric. The present invention is also directed towards a method for using a concentrated fabric care composition, which is diluted, and then applied directly onto a fabric. Thus, the "concentrated fabric care composition", as described herein indicates that a dilution thereof is required, prior to applying it directly onto a fabric.

Fabric Care Composition:

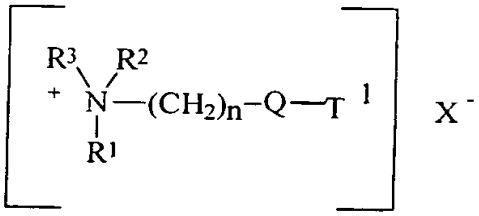
It has surprisingly been found that, as compared to other fabric care compositions which are added, for example, to a rinse cycle, significant benefits result from relatively low levels of fabric softening active which are applied directly onto a fabric. Accordingly, an embodiment of the fabric care composition herein comprises from about 0.01% to about 1%, preferably from about 0.02% to about 0.8%, and more preferably from about 0.04% to about 0.5% of a fabric softening active by weight of the fabric care composition, a solvent, and the balance adjunct materials. Without intending to be limited by theory, it is believed that the fabric softening actives relax the fabric fibers by blocking the hydrogen bonding sites, in order to provide softer clothes with reduced static, easier ironing, improved shape retention, wrinkle reduction, a reduced likelihood of leaving darkened marks, and better in-wear comfort. It has been surprisingly found that when included in the fabric care composition of the present invention, starch and silicone may reduce the benefits of previously-used fabric softening actives and/or be otherwise undesirable. Thus, in an embodiment of the present invention, the fabric care composition is substantially free of starch, and substantially free of silicone. Without intending to be limited by theory, it is believed that a fabric care composition free of starch and silicone does not reduce the benefits of any previously-used fabric softening actives, such as those which may have been used in a rinse or drying cycle.

The fabric care composition and/or the concentrated fabric care composition useful herein may be an opaque dispersion, and is preferably clear and/or translucent.

Fabric Softening Active

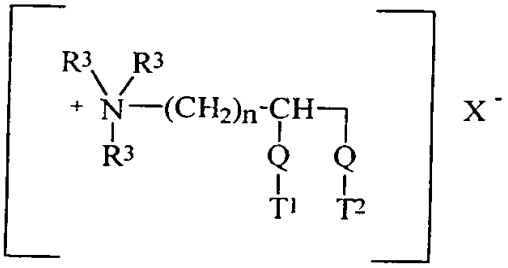
The fabric softening actives useful herein may be any of those known for use in a laundry process. Preferred fabric softening actives include quaternary ammonium compounds or amine precursors thereof, cationic ammonium softening compounds, nonionic softening compounds, and mixtures thereof.

The preferred quaternary ammonium compounds or amine precursors of the present invention are cationic biodegradable quaternary ammonium compounds having the formula (I), (II), (III), (IV), or (V), below :



(I)

or



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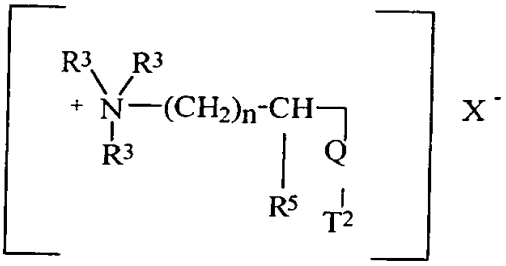

(III)

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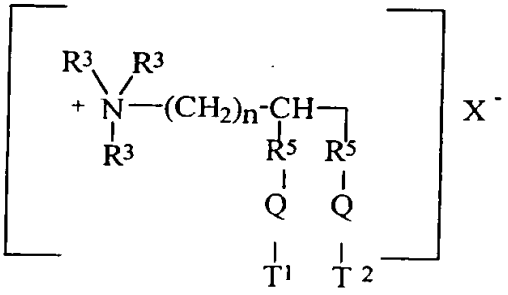
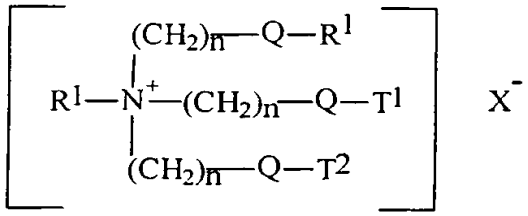


(IV)

or



(V)

wherein Q, n, R and T are selected independently and

Q is -O-C(O)- or -C(O)-O- or -O-C(O)-O- or -NR^4-C(O)- or -C(O)-NR^4- or -$(OCH_2CH_2)_m$-O-C(O)- where m = 0 - 10;

R^1 is $(CH_2)_n$-Q-T^2 or T^3 or R^3;

R^2 is $(CH_2)_m$-Q-T^4 or T^5 or R^3;

R^3 is C_1-C_4 alkyl or C_1-C_4 hydroxyalkyl or H;

R^4 is H or C_1-C_4 alkyl or C_1-C_4 hydroxyalkyl;

R^5 is C_1-C_4 alkylene groups;

T^1, T^2, T^3, T^4, T^5 are (the same or different) C_{11}-C_{22} alkyl or alkenyl;

n and m are integers from 1 to 4; and

X^- is a softener-compatible anion, such as chloride, methyl sulfate, etc.

The alkyl, or alkenyl, chain T^1, T^2, T^3, T^4, T^5 must contain at least 11 carbon atoms, preferably at least 16 carbon atoms. The chain may be straight or branched.

Q, n, T^1, and T^2 may be the same or different when more than one is present in the molecule.

Tallow is a convenient and inexpensive source of long chain alkyl and alkenyl material. Another convenient source would be palm olein oil. The compounds wherein T^1, T^2, T^3, T^4, T^5 represents the mixture of long chain materials typical for tallow, or palm olein are particularly preferred.

Preferred quaternary ammonium compounds or amine precursors thereof include those of formula (I) or (II) or (V) wherein Q is -O-C(O)-, R^1 is $(CH_2)_n$-Q-T^2, R^2 and R^3 are the same or different and are C_1-C_4 alkyl or C_1-C_4 hydroxyalkyl or H; T^1 and T^2 are (the same or different) C_{11}-C_{22} alkyl or alkenyl; n and m are integers from 1 to 4; and X^- is a softener-compatible anion, such as chloride, methyl sulfate, etc.

Specific examples of quaternary ammonium compounds of formula (I) or (II) suitable for use in the aqueous fabric softening compositions herein include :

1) N,N-di(tallowyl-oxy-ethyl)-N,N-dimethyl ammonium chloride;

2) N,N-di(tallowyl-oxy-ethyl)-N-methyl, N-(2-hydroxyethyl) ammonium chloride;

3) 1,2-ditallowyloxy-3-N,N,N-trimethylammoniopropane chloride.;

4) N,N-di(palmityl-oxy-ethyl)-N-hydroxyethyl, N-methyl ammonium methyl sulfate.

5) N,N-ditallow-oxy-ethyl-N,-hydroxyethyl, N-methyl ammonium chloride.

and mixtures of any of the above materials.

Of these, compounds 1-2 are examples of compounds of Formula (I); compound 3 is a compound of Formula (II); compounds 4-5 are examples of compound (V).

Particularly preferred is N,N-di(tallowoyl-oxy-ethyl)-N,N-dimethyl ammonium chloride, where the tallow chains are at least partially unsaturated, and N,N-ditallow-oxy-ethyl-N-hydroxyethyl, N-methyl ammonium chloride and its ethoxylated equivalents

The level of unsaturation of the tallow chain can be measured by the Iodine Value (IV) of the corresponding fatty acid, which in the present case should preferably be in the range of from 5 to 100 with two categories of compounds being distinguished, having a IV below or above 25, and a variable IV value for VI depending on the degree of ethxoylation, in which the more ethoxylation, the less IV.

Indeed, for compounds of Formula (II) made from tallow fatty acids having a IV of from 5 to 25, preferably 15 to 20, it has been found that a cis/trans isomer weight ratio greater than about 30/70, preferably greater than about 50/50 and more preferably greater than about 70/30 provides optimal concentrability.

For compounds of Formula (II) made from tallow fatty acids having a IV of above 25, the ratio of cis to trans isomers has been found to be less critical unless very high concentrations are needed.

At least 80% of the preferred diester quaternary ammonium compounds, i.e., DEQA of formula (I), (II), and (V) is preferably in the diester form, and from 0% to about 30%, preferably less than about 25%, more preferably less than about 20%, can be monoester, i.e., DEQA monoester (e.g., containing only one -Q-T^1 group). As used herein, when the diester is specified, it will include the monoester that is normally present in manufacture. For softening, under no/low detergent carry-over laundry conditions the percentage of monoester should be

as low as possible, preferably no more than about 2.5%. However, under high detergent carry-over conditions, some monoester is preferred. The overall ratios of diester to monoester are from about 100:1 to about 2:1, preferably from about 50:1 to about 5:1, more preferably from about 13:1 to about 8:1. Under high detergent carry-over conditions, the di/monoester ratio is preferably about 11:1. The level of monoester present can be controlled in the manufacturing of the softener compound.

Other examples of suitable quaternary ammonium compounds of Formula (I), (II) and (V) are obtained by, e.g.,

- replacing "tallow" in the above compounds with, for example, coco, palm, lauryl, oleyl, ricinoleyl, stearyl, palmityl, or the like, said fatty acyl chains being either fully saturated, or preferably at least partly unsaturated;

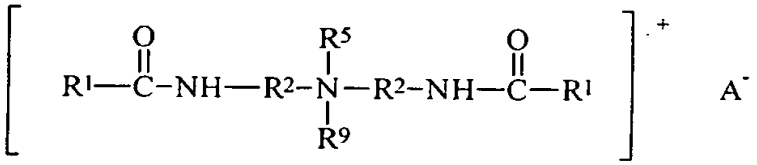
- replacing "methyl" in the above compounds with ethyl, ethoxy, propyl, propoxy, isopropyl, butyl, isobutyl or t-butyl;

- replacing "chloride" in the above compounds with bromide, methylsulfate, formate, sulfate, nitrate, and the like.

In fact, the anion is merely present as a counterion of the positively charged quaternary ammonium compounds. The nature of the counterion is not critical at all to the practice of the present invention. The scope of this invention is not considered limited to any particular anion. By "amine precursors thereof" is meant the secondary or tertiary amines corresponding to the above quaternary ammonium compounds.

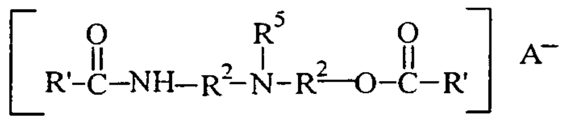
Other formula (I) quaternary ammonium compounds useful as fabric softeners in the present invention include:

(i) diamido quaternary ammonium salts having the formula:



wherein R^1 is an acyclic aliphatic C_{15}-C_{21} hydrocarbon group, each R^2 is the same or different divalent alkylene group having 1 to 3 carbon atoms, R^5 and R^9 are C_1-C_4 saturated alkyl or hydroxyalkyl groups, or $(CH_2CH_2O)_nH$ wherein n is equal to 1 to about 5 and A^- is an anion;

(ii)



wherein R^1 is an acyclic aliphatic C_{15}-C_{21} hydrocarbon group, R^2 is the same or different divalent alkylene group having 1 to 3 carbon atoms, R^5 are C_1-C_4 saturated alkyl or hydroxyalkyl groups, A^- is an anion and R^2 is the same or different from the other R^2, and

(iii) mixtures thereof.

Examples of compounds of (i) or (ii) as described above are the well-known and include methyl bis(tallowamidoethyl)(2-hydroxyethyl)ammonium methylsulfate and methyl bis(hydrogenated tallowamidoethyl)(2-hydroxyethyl)ammonium methylsulfate; these materials are available from Witco Chemical Company under the trade names VARISOFT® 222 and VARISOFT® 110, respectively: The quaternary ammonium or amine precursors compounds herein are present at levels of from about 0.05% to about 50% by weight of compositions herein, depending on the composition execution which can be diluted with a preferred level of active from about 5% to about 15% by weight, or concentrated, with a preferred level of active from about 15% to about 50%, most preferably about 15% to about 35% by weight.

The pH of these compositions herein can be regulated by the addition of a Brønsted acid. Examples of suitable Brønsted acids include the inorganic mineral acids, carboxylic acids, in particular the low molecular weight (C_1-C_5) carboxylic acids, and alkylsulfonic acids. Suitable inorganic acids include HCl, H_2SO_4, HNO_3 and H_3PO_4. Suitable organic acids include formic, acetic, citric, lactic, benzoic, methylsulfonic and ethylsulfonic acid. Preferred acids are citric, hydrochloric, phosphoric, formic, methylsulfonic acid, lactic acid and benzoic acids.

Cationic fabric softening compounds useful herein are described in U.S. Pat. No. 4,661,269, issued April 28, 1987, in the names of Toan Trinh, Errol H. Wahl, Donald M. Swartley, and Ronald L. Hemingway; U.S. Pat. No. 4,439,335, Burns, issued March 27, 1984; and in U.S. Pat. Nos.: 3,861,870, Edwards and Diehl; 4,308,151, Cambre; 3,886,075, Bernardino; 4,233,164, Davis; 4,401,578, Verbruggen; 3,974,076, Wiersema and Rieke; 4,237,016, Rudkin, Clint, and

Young; and European Patent Application publication No. 472,178, by Yamamura et al., the disclosures of which are all herein incorporated by reference.

For example, additional cationic fabric softener agents useful herein may comprise one or two of the following fabric softening agents:

(a) the reaction product of higher fatty acids with a polyamine selected from the group consisting of hydroxyalkylalkylenediamines and dialkylenetriamines and mixtures thereof (preferably from about 10% to about 80%); and/or

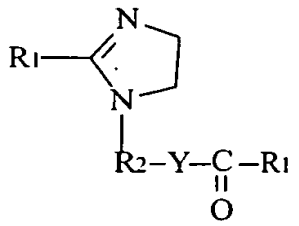
(b) cationic nitrogenous salts containing long chain acyclic aliphatic C_{15}-C_{22} hydrocarbon groups (preferably from about 3% to about 40%);

with said (a) and (b) preferred percentages being by weight of the fabric softening agent component of the present invention compositions.

Following are the general descriptions of the preceding (a) and (b) softener ingredients (including certain specific examples which illustrate, but do not limit the present invention).

Component (a): Softening agents (actives) of the present invention may be the reaction products of higher fatty acids with a polyamine selected from the group consisting of hydroxyalkylalkylenediamines and dialkylenetriamines and mixtures thereof. These reaction products are mixtures of several compounds in view of the multi-functional structure of the polyamines.

The preferred Component (a) is a nitrogenous compound selected from the group consisting of the reaction product mixtures or some selected components of the mixtures. More specifically, the preferred Component (a) is compounds selected from the group consisting of substituted imidazoline compounds having the formula:



wherein R^1 is an acyclic aliphatic C_{15}-C_{21} hydrocarbon group and R^2 is a divalent C_1-C_3 alkylene group, and Y is NH or O.

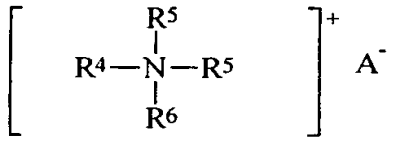
Component (a) materials are commercially available as: Mazamide® 6, sold by Mazer Chemicals, or Ceranine® HC, sold by Sandoz Colors &

Chemicals; stearic hydroxyethyl imidazoline sold under the trade names of Alkazine® ST by Alkaril Chemicals, Inc., or Schercozoline® S by Scher Chemicals, Inc.; N,N"-ditallowalkoyldiethylenetriamine; 1-tallowamidoethyl-2-tallowimidazoline (wherein in the preceding structure R^1 is an aliphatic C_{15}-C_{17} hydrocarbon group and R^2 is a divalent ethylene group).

Certain of the Components (a) can also be first dispersed in a Brønsted acid dispersing aid having a pKa value of not greater than about 4; provided that the pH of the final composition is not greater than about 5. Some preferred dispersing aids are hydrochloric acid, phosphoric acid, or methylsulfonic acid.

Both N,N"-ditallowalkoyldiethylenetriamine and 1-tallow(amidoethyl)-2-tallowimidazoline are reaction products of tallow fatty acids and diethylenetriamine, and are precursors of the cationic fabric softening compound methyl-1-tallowamidoethyl-2-tallowimidazolinium methylsulfate (see "Cationic Surface Active Agents as Fabric Softeners," R. R. Egan, Journal of the American Oil Chemicals' Society, January 1978, pages 118-121). N,N"-ditallow alkoyldiethylenetriamine and 1-tallowamidoethyl-2-tallowimidazoline can be obtained from Witco Chemical Company as experimental chemicals. Methyl-1-tallowamidoethyl-2-tallowimidazolinium methylsulfate is sold by Witco Chemical Company under the tradename VARISOFT® 475.

Component (b): The preferred Component (b) is a cationic nitrogenous salt, preferably selected from acyclic quaternary ammonium salts having the formula:



wherein R^4 is an acyclic aliphatic C_{15}-C_{22} hydrocarbon group, R^5 is R^4 or C_1-C_4 saturated alkyl or hydroxy alkyl groups, and R^6 is R^4 or R^5 and A- is an anion.

Examples of Component (b) are the monoalkyltrimethylammonium salts such as monotallowtrimethylammonium chloride, mono(hydrogenatedtallow)trimethylammonium chloride, palmityltrimethyl ammonium chloride and soyatrimethylammonium chloride, sold by Witco

Chemical Company under the trade name Adogen® 471, Adogen® 441, Adogen ® 444, and Adogen® 415, respectively. In these salts, R^4 is an acyclic aliphatic C_{16}-C_{18} hydrocarbon group, and R^5 and R^6 are methyl groups. Mono(hydrogenated tallow)trimethylammonium chloride and monotallowtrimethylammonium chloride are preferred. Further examples include dialkyldi methylammonium salts such as ditallowdimethylammonium chloride. Examples of commercially available dialkyldimethyl ammonium salts usable in the present invention are di(hydrogenated tallow)dimethylammonium chloride (tradename Adogen® 442), ditallowdimethyl ammonium chloride (trade name Adogen® 470), distearyl dimethylammonium chloride (trade name Arosurf® TA-100), all available from Witco Chemical Company, dimethylstearylbenzyl ammonium chloride sold under the trade names VARISOFT® SDC by Witco Chemical Company and AMMONYX® 490 by Onyx Chemical Company. Also preferred are those selected from the group consisting of di(hydrogenated tallow)dimethylammonium chloride, ditallowdimethylammonium chloride. Mixtures of the above examples are also included within the scope of the present invention.

A preferred compound of Component (a) includes the reaction product of about 2 moles of hydrogenated tallow or palm fatty acids with about 1 mole of N-2-hydroxyethylethylenediamine or diethylene triamine or 1-amino-2,3, propane diol, or ethylene diamine, N-hydroxyethyl, or trihydroxyethyl amine, or monohydroxydimethyl amine, or ethoxylated dihydroxyethyl methyl amine or ethoxylated trihydroxyethyl amine where the ethoxylation may contain 0 to 10 moles of ethylene oxide and is present at a level of from about 20% to about 70% by weight of the fabric softening component of the present invention compositions while preferred compounds of component (b) include mono(hydrogenated tallow)trimethyl ammonium chloride and di(hydrogenated tallow)dimethyl ammonium chloride present at a level of from about 3% to about 30% by weight of the fabric softening component of the present invention compositions; 1-tallowamidoethyl-2-tallowimidazoline, and mixtures thereof; wherein mixtures of compounds of (a) and (b) are present at a level of from about 20% to about 60% by weight of the fabric softening component of the present invention compositions; and wherein the weight ratio of said di(hydrogenated tallow)dimethylammonium chloride to said 1-tallowamidoethyl-2-tallowimidazoline is from about 1:2 to about 6:1.

In the cationic nitrogenous salts described herein before, the anion A- provides charge neutrality. Most often, the anion used to provide charge neutrality in these salts is a halide, such as chloride or bromide. However, other anions can be used, such as methylsulfate, ethylsulfate, hydroxide, acetate, formate, citrate, sulfate, carbonate, and the like. Chloride and methylsulfate are preferred herein as anion A-.

Nonionic softening compounds, preferably in combination with cationic softening compounds are also useful herein. Typically, such nonionic softener compounds have a HLB of from about 2 to about 9, more typically from about 3 to about 7. Such nonionic softener compounds tend to be readily dispersed either by themselves, or when combined with other materials such as single-long-chain alkyl cationic surfactant described in detail hereinafter. Dispersibility can be improved by using more single-long-chain alkyl cationic surfactant, mixture with other materials as set forth hereinafter, use of hotter water, and/or more agitation. In general, the materials selected should be relatively crystalline, higher melting, (e.g. >40 °C) and relatively water-insoluble.

The level of optional nonionic softener compound in the compositions herein is typically from about 0% to about 10%, preferably from about 1% to about 5% by weight of the composition.

Preferred nonionic softener compounds are fatty acid partial esters of polyhydric alcohols, or anhydrides thereof, wherein the alcohol, or anhydride, contains from 2 to 18, preferably from 2 to 8, carbon atoms, and each fatty acid moiety contains from 12 to 30, preferably from 16 to 20, carbon atoms. Typically, such softeners contain from one to 3, preferably 2 fatty acid groups per molecule.

The polyhydric alcohol portion of the ester can be ethylene glycol, glycerol, poly (e.g., di-, tri-, tetra, penta-, and/or hexa-) glycerol, xylitol, sucrose, erythritol, pentaerythritol, sorbitol or sorbitan. Sorbitan esters and polyglycerol monostearate are particularly preferred.

The fatty acid portion of the ester is normally derived from fatty acids having from 12 to 30, preferably from 16 to 20, carbon atoms, typical examples of said fatty acids being lauric acid, myristic acid, palmitic acid, stearic acid, oleic and behenic acid.

Highly preferred optional nonionic softening agents for use in the present invention are the sorbitan esters, which are esterified dehydration products of sorbitol, and the glycerol esters.

Commercial sorbitan monostearate is a suitable material. Mixtures of sorbitan stearate and sorbitan palmitate having stearate/palmitate weight ratios varying between about 10:1 and about 1:10, and 1,5-sorbitan esters are also useful.

Glycerol and polyglycerol esters, especially glycerol, diglycerol, triglycerol, and polyglycerol mono- and/or di-esters, preferably mono-, are preferred herein (e.g. polyglycerol monostearate with a trade name of Radiasurf 7248).

Useful glycerol and polyglycerol esters include mono-esters with stearic, oleic, palmitic, lauric, isostearic, myristic, and/or behenic acids and the diesters of stearic, oleic, palmitic, lauric, isostearic, behenic, and/or myristic acids. It is understood that the typical mono-ester contains some di- and tri-ester, etc.

The "glycerol esters" also include the polyglycerol, e.g., diglycerol through octaglycerol esters. The polyglycerol polyols are formed by condensing glycerin or epichlorohydrin together to link the glycerol moieties via ether linkages. The mono- and/or diesters of the polyglycerol polyols are preferred, the fatty acyl groups typically being those described herein before for the sorbitan and glycerol esters.

In addition, since the foregoing compounds (diesters) are somewhat labile to hydrolysis, they should be handled rather carefully when used to formulate the compositions herein. For example, stable liquid compositions herein are formulated at a pH (neat) in the range of from about 2 to about 7, preferably from about 2 to about 5, more preferably from about 2 to about 4.5. For best product odor stability, when the IV is greater that about 25, the neat pH is from about 2.8 to about 3.5, especially for lightly scented products. This appears to be true for all of the above softener compounds and is especially true for the preferred DEQA specified herein, i.e., having an IV of greater than about 20, preferably greater than about 40. The limitation is more important as IV increases. The pH can be adjusted by the addition of a Brønsted acid as described above. pH ranges for making chemically stable softener compositions containing diester quaternary ammonium fabric softening compounds are disclosed in U.S. Pat. No. 4,767,547, Straathof et al., issued on Aug. 30, 1988, which is incorporated herein by reference.

A preferred fabric softening active is selected from the group consisting of ditallow or dipalmityl dimethylammonium chloride or methyl sulfate (DTDMAC); dihydrogenated tallow (palm) dimethylammonium chloride; dihydrogenated

tallow (palm) dimethylammonium methylsulfate; distearyl dimethylammonium chloride; dioleyl dimethylammonium chloride or methyl sulfate; dipalmityl hydroxyethyl methylammonium chloride or methyl sulfate; stearyl benzyl dimethylammonium chloride or methyl sulfate; tallow (palm) trimethylammonium chloride or methyl sulfate; hydrogenated tallow (palm) trimethylammonium chloride or methyl sulfate; C_{12-20} alkyl ethoxyhydroxyethyl or hydroxyethyl dimethylammonium chloride or methyl sulfate; di-C_{12-20} alkyl dihydroxyethyl or diethoxyhydroxyethyl methylammonium chloride or methyl sulfate; di(stearoyloxyethyl) dimethylammonium chloride (DSOEDMAC) or methyl sulfate; di(tallow-oxy-ethyl) or di(palm-oxy-ethyl) dimethylammonium chloride or methyl sulfate; monotallow-oxy-ethyl or monopalm-oxy-ethyl, dihydroxyethyl, monomethyl, ammounium chloride or methyl sulfate, ditallow (dipalm) imidazolinium methylsulfate or chloride; ditallow-ethoxy-ethyl or di-palm-ethoxy-ethyl di-ethyl, mono-ethoxy-ethyl methyl ammnonium choloride or methyl sulfate, 1-(2-tallowylamidoethyl)-2-tallowyl imidazolinium methylsulfate, 1-(2-palmitylamidoethyl)-2-palmityl imadazolinium chloride or methyl sulfate and mixtures thereof.

Solvent

At least one solvent is provided in the fabric care composition described herein. The solvent promotes easy application of the fabric softening active directly onto the target fabric. The solvent also allows the fabric care composition to be evenly applied directly onto a fabric or a portion of a fabric. In cases where a concentrated fabric care composition is provided and diluted to form a fabric care composition, as further described below, at least two solvents (i.e., the solvent in the concentrated fabric care composition and the dilution solvent) are provided herein. These solvents may be either the same, or different solvents.

The solvent useful in the fabric care composition and/or the concentrated fabric care composition described herein is selected from water, a low molecular weight organic solvent and mixtures thereof. The solvent employed in the instant compositions preferably comprises water due to its low cost, relative availability, safety, and environmental compatibility. If present, the water content in the solvent is generally more than about 50%, preferably more than about 80%, more preferably more than about 85%, by weight of the solvent. The low

molecular weight, e.g., less than about 150 g/mole, organic solvents useful herein include lower alcohols such as C_{1-4} monohydric alcohols, dihydric (glycol, etc.) trihydric (glycerol, etc.), and polyhydric (polyols) alcohols, such as C_{2-6} polyhydric alcohols. Preferably, ethanol, propanol, isopropanol, propylene glycol, and mixtures thereof are employed herein. More preferably, use of the flammable alcohols (e.g., monohydric alcohols), are minimized, or avoided, herein. The amount of solvent present in the compositions described herein is generally at least about 25%, preferably from about 25% to about 99.9%, and more preferably from about 50% to about 99.9%, by weight of the fabric care composition.

In a preferred embodiment, the solvent contains from about 50% to about 99% water, and from about 0.01% to about 50% alcohols and glycols. The presence of the organic solvents help to better distribute the softening actives, maintain product stability, and reduce fabric wrinkling.

The present compositions may take the form of clear or translucent liquid compositions. This is particularly desirable, as the fabric care composition herein is intended to be directly applied to a fabric. In such instances, the solvent preferably is selected to minimize solvent odor impact in the composition and to provide a low viscosity to the final composition. For example, isopropyl alcohol is not very effective and has a strong odor, while n-Propyl alcohol is more effective, but also has a distinct odor. Several butyl alcohols also have odors but can be used for effective clarity/stability, especially when mixed with another solvent to minimize their odor. The alcohols are also selected for optimum low temperature stability, that is, they are able to form compositions that are liquid with acceptable low viscosities and translucent, preferably clear, down to about 4 °C and are able to recover after storage down to about -7 °C.

The suitability of any solvent for the formulation of the liquid, preferably clear, fabric care compositions herein with the requisite stability is surprisingly selective. Suitable solvents may be selected based upon their octanol/water partition coefficient (P). Octanol/water partition coefficient of a solvent is the ratio between its equilibrium concentration in octanol and in water. The partition coefficients of the solvent ingredients of this invention are conveniently given in the form of their logarithm to the base 10, logP.

The logP of many ingredients has been reported; for example, the Pomona92 database, available from Daylight Chemical Information Systems, Inc.

(Daylight CIS), Irvine, California, contains many, along with citations to the original literature. However, the logP values are most conveniently calculated by the "CLOGP" program, also available from Daylight CIS. This program also lists experimental logP values when they are available in the Pomona92 database. The "calculated logP" (ClogP) is determined by the fragment approach of Hansch and Leo (cf., A. Leo, in Comprehensive Medicinal Chemistry, Vol. 4, C. Hansch, P. G. Sammens, J. B. Taylor and C. A. Ramsden, Eds., p. 295, Pergamon Press, 1990, incorporated herein by reference). The fragment approach is based on the chemical structure of each ingredient, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding. These ClogP values, which are the most reliable and widely used estimates for this physicochemical property, are preferably used instead of the experimental logP values in the selection of the principal solvent ingredients which are useful in the present invention. Other methods that can be used to compute ClogP include, e.g., Crippen's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 27, 21 (1987); Viswanadhan's fragmentation method as disclose in J. Chem. Inf. Comput. Sci., 29, 163 (1989); and Broto's method as disclosed in Eur. J. Med. Chem. - Chim. Theor., 19, 71 (1984). The solvents herein are selected from those having a ClogP of from about 0.15 to about 0.64, preferably from about 0.25 to about 0.62, and more preferably from about 0.40 to about 0.60, said principal solvent preferably being at least somewhat asymmetric, and preferably having a melting, or solidification, point that allows it to be liquid at, or near room temperature. Solvents that have a low molecular weight and are biodegradable are also desirable for some purposes. The more asymmetric solvents appear to be very desirable, whereas the highly symmetrical solvents such as 1,7-heptanediol, or 1,4-bis(hydroxymethyl) cyclohexane, which have a center of symmetry, appear to be unable to provide the preferred clear compositions when used alone, even though their ClogP values fall in the preferred range.

The most preferred solvents can be identified by the appearance of the fabric softener active vesicles, as observed via cryogenic electron microscopy of the compositions that have been diluted to the concentration used in the rinse. These dilute compositions appear to have dispersions of fabric softener actives that exhibit a more uni-lamellar appearance than conventional fabric softener compositions. The closer to uni-lamellar the appearance, the better the compositions seem to perform. These compositions provide surprisingly good

fabric softening as compared to similar compositions prepared in the conventional way with the same fabric softener active.

Operable solvents are disclosed and listed below which have ClogP values which fall within the requisite range. These include mono-ols, C_6 diols, C_7 diols, octanediol isomers, butanediol derivatives, trimethylpentanediol isomers, ethylmethylpentanediol isomers, propyl pentanediol isomers, dimethylhexanediol isomers, ethylhexanediol isomers, methylheptanediol isomers, octanediol isomers, nonanediol isomers, alkyl glyceryl ethers, di(hydroxy alkyl) ethers, and aryl glyceryl ethers, aromatic glyceryl ethers, alicyclic diols and derivatives, C_3C_7 diol alkoxylated derivatives, aromatic diols, and unsaturated diols. Particularly preferred solvents include hexanediols such as 1,2-hexanediol and 2-ethyl-1,3-hexanediol and pentanediols such as 2,2,4-trimethyl-1,3-pentanediol. These solvents are all disclosed as "principal solvents" in U.S. Patent 5,747,443 to Wahl, et al., issued May 5, 1998 with the title "FABRIC SOFTENING COMPOUND/COMPOSITION"; and U.S. Patent application numbers 08/621,019; 08/620,627; 08/620,767; 08/620,513; 08/621,285; 08/621,299; 08/621,298; 08/620,626; 08/620,625; 08/620,772; 08/621,281; 08/620,514; and 08/620,958, all filed March 22, 1996 and all having the title "CONCENTRATED, STABLE, PREFERABLY CLEAR, FABRIC SOFTENING COMPOSITION".

Adjunct Materials

The balance of the fabric care composition is comprised of adjunct materials useful in fabric care compositions, and ironing spray compositions. Any such materials may be useful herein as long as they do not reduce or eliminate the benefits provided by any previously-used fabric softening actives. For example, such adjunct materials may include perfumes, surfactants, antibacterial agents, pH buffers, dyes, optical brighteners, viscosity/dispersability modifiers, dye transfer inhibition agents, soil release agents, phase stabilizers, stabilizers, and mixtures thereof. Preferred adjunct materials include, surfactants, buffers, viscosity modifiers, and perfumes, and mixtures thereof.

Because the fabric care composition may be sprayed directly onto the fabric to be treated, relatively low levels of such adjunct materials are typically required. Without intending to be limited by theory, it is believed that the high efficiency of deposition allows such relatively small amounts of such adjunct

materials to still provide significant benefits. Accordingly, if present, each adjunct material typically comprises from about 0.001 to about 10%, preferably from about 0.01% to about 5%, and more preferably from about 0.01% to about 3% of the fabric care composition, unless otherwise specifically noted, below.

The perfumes useful herein include those commonly used in fabric care compositions, and are commonly available from, for example, Firmenich, Inc. of Princeton, New Jersey, U. S. A.; and Givaudan Corporation, of Clifton, New Jersey, U. S. A.

Surfactants are typically selected from the group consisting of single long chain alkyl cationic surfactants; nonionic surfactants; amine oxides; fatty acids; or mixtures thereof, typically used at a level of from 0% to about 30% of the composition. In addition, the compositions of the present invention may include less than about 10% by weight of an amphoteric surfactant. Preferably, the compositions include less than about 5% and more preferably less than about 1% by weight of an amphoteric surfactant. As is further discussed below, surfactants may also be present as viscosity/dispersability modifiers.

Antibacterial agents are useful herein to prevent growth of bacteria in the fabric care composition during storage. As an additional benefit, antibacterial agents may also provide a disinfecting benefit on the fabric to be treated. The antibacterial agents useful herein include benzalkonium chloride, glutaraldehyde, and mixtures thereof. These are commonly available from, for example, Alkaquat DMB-451-50 from Rhone-Poulenc Inc., North American Chemicals, Surfactants & Specialties of Cranbury, New Jersey, U. S. A.; and AQUCAR® Microbiocides from Union Carbide Corporation, of Danbury, Connecticut, U. S. A. An especially preferred antibacterial agent is KATHON® by Rohm and Haas, Philadelphia, Pennsylvania, U.S.A. This antibacterial agent is available as either Kathon CG or Kathon CG II.

The fabric care composition may also contain one or more commonly known pH buffers to maintain the composition at a constant pH during storage and use.

Certain dyes may also be useful herein and may be easily purchased throughout the world; however, care should be taken to avoid dyes or dye levels which may stain or otherwise discolor the fabrics to be treated. Accordingly, if present, low levels of water-soluble dyes are preferred to minimize the potential concern of fabric staining.

Optical brighteners may also be present herein. Commercial optical brighteners which may be useful in the present invention can be classified into subgroups, which include, but are not necessarily limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiphene-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents. Examples of such optical brighteners are disclosed in "The Production and Application of Fluorescent Brightening Agents", M. Zahradnik, Published by John Wiley & Sons, New York (1982). Specific examples of optical brighteners which are useful in the present fabric care composition are those identified in U.S. Patent 4,790,856, issued to Wixon on December 13, 1988. These brighteners include the PHORWHITE™ series of brighteners from Verona. Other brighteners disclosed in this reference include: Tinopal UNPA, Tinopal CBS and Tinopal 5BM; available from Ciba-Geigy; Artic White CC and Artic White CWD, available from Hilton-Davis, located in Italy; the 2-(4-stryl-phenyl)-2H-napthol[1,2-d]triazoles; 4,4'-bis- (1,2,3-triazol-2-yl)-stilbenes; 4,4'-bis(stryl)bisphenyls; and the aminocoumarins. Specific examples of these brighteners include 4-methyl-7-diethyl- amino coumarin; 1,2-bis(-venzimidazol-2-yl)ethylene; 1,3-diphenyl-phrazolines; 2,5-bis(benzoxazol-2-yl)thiophene; 2-stryl-napth-[1,2-d]oxazole; and 2-(stilbene-4-yl)-2H-naphtho- [1,2-d]triazole. See also U.S. Patent 3,646,015, issued February 29, 1972 to Hamilton. Anionic brighteners are preferred herein.

Viscosity/dispersability modifiers can be added for the purpose of facilitating the solubilization and/or dispersion, concentration, and/or improving phase stability (e.g., viscosity stability). Some preferred dispersability modifiers may include:

(A) Single-Long-Chain Alkyl Cationic Surfactant

The mono-long-chain-alkyl (water-soluble) cationic surfactants in liquid compositions are at a level of from 0% to about 30%, preferably from about 0.01% to about 10%, the total single-long-chain cationic surfactant present being at least at an effective level.

Such mono-long-chain-alkyl cationic surfactants useful in the present invention are, preferably, quaternary ammonium salts of the general formula:

$$(R^2N^+R_3)\ X^-$$

wherein the R^2 group is a C_{10}-C_{22} hydrocarbon group, preferably C_{12}-C_{18} alkyl group or the corresponding ester linkage interrupted group with a short

alkylene (C_1-C_4) group between the ester linkage and the N, and having a similar hydrocarbon group, e.g., a fatty acid ester of choline, preferably C_{12}-C_{14} (coco) choline ester and/or C_{16}- C_{18} tallow choline ester; each R is a C_1-C_4 alkyl or substituted (e.g., hydroxy) alkyl, or hydrogen, preferably methyl, and the counterion X^- is a softener compatible anion, for example, chloride, bromide, methyl sulfate, etc.

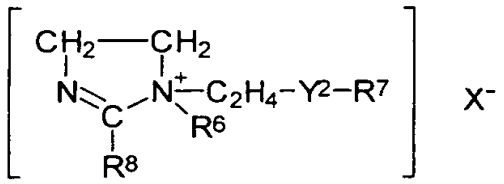
The ranges above represent the amount of the single-long-chain-alkyl cationic surfactant which is preferably added to the composition of the present invention. The ranges do not include the amount of monoester which is already present in component (A), the diester quaternary ammonium compound, the total present being at least at an effective level.

The long chain group R^2, of the single-long-chain-alkyl cationic surfactant, typically contains an alkyl, or alkylene group having from about 10 to about 22 carbon atoms, preferably from about 12 to about 16 carbon atoms for solid compositions, and preferably from about 12 to about 18 carbon atoms for liquid compositions. This R^2 group can be attached to the cationic nitrogen atom through a group containing one, or more, ester, amide, ether, amine, etc., preferably ester, linking groups which can be desirable for increased hydrophilicity, biodegradability, etc. Such linking groups are preferably within about three carbon atoms of the nitrogen atom. Suitable biodegradable single-long-chain alkyl cationic surfactants containing an ester linkage in the long chain are described in U.S. Pat. No. 4,840,738, Hardy and Walley, issued June 20, 1989, said patent being incorporated herein by reference.

It will be understood that the main function of the water-soluble cationic surfactant is to lower the composition's viscosity and/or increase the dispersability of the diester softener compound and it is not, therefore, essential that the cationic surfactant itself have substantial softening properties, although this may be the case. Also, surfactants having only a single long alkyl chain, presumably because they have greater solubility in water, can protect the diester softener from interacting with anionic surfactants and/or detergent builders that may be carried over from a previous laundering step.

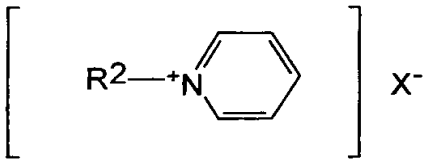
Other cationic materials with ring structures such as alkyl imidazoline, imidazolinium, pyridine, and pyridinium salts having a single C_{12}-C_{30} alkyl chain can also be used. Typically, a very low pH is required to stabilize ring structures, e.g., imidazoline.

Some alkyl imidazolinium salts useful in the present invention have the general formula:



wherein Y^2 is -C(O)-O-, -O-(O)-C-, -C(O)-N(R^5), or -N(R^5)-C(O)- in which R^5 is hydrogen or a C_1-C_4 alkyl radical; R^6 is a C_1-C_4 alkyl radical; R^7 and R^8 are each independently selected from R and R^2 as defined herein before for the single-long-chain cationic surfactant with only one being R^2.

Some alkyl pyridinium salts useful in the present invention have the general formula:



wherein R^2 and X^- are as defined above. A typical material of this type is cetyl pyridinium chloride.

Amine oxides can also be used. Suitable amine oxides include those with one alkyl, or hydroxyalkyl, moiety of about 8 to about 22 carbon atoms, preferably from about 10 to about 18 carbon atoms, more preferably from about 12 to about 14 carbon atoms, and two alkyl moieties selected from the group consisting of alkyl groups and hydroxyalkyl groups containing from one to about three carbon atoms.

Examples of amine oxides include: dimethyloctylamine oxide; diethyldecylamine oxide; dimethyldodecylamine oxide; dipropyltetradecylamine oxide; dimethyl-2-hydroxyoctadecylamine oxide; dimethylcoconutalkylamine oxide; and bis-(2-hydroxyethyl)dodecylamine oxide.

(B) Nonionic Surfactant (Alkoxylated Materials)

Suitable nonionic surfactants to serve as the viscosity/dispersability modifier include addition products of ethylene oxide and, optionally, propylene oxide, with fatty alcohols, fatty acids, fatty amines, etc. They are referred to herein as ethoxylated fatty alcohols, ethoxylated fatty acids, and ethoxylated fatty amines.

Any of the alkoxylated materials of the particular type described hereinafter can be used as the nonionic surfactant. In general terms, the nonionic herein, when used alone, are at a level of from 0% to about 30%, preferably from about 0.001% to about 20%, more preferably from about 0.01% to about 10%. Suitable compounds are substantially water-soluble surfactants of the general formula:

$$R^2 - Y - (C_2H_4O)_z - C_2H_4OH$$

wherein R^2 is selected from the group consisting of primary, secondary and branched chain alkyl and/or acyl hydrocarbyl groups; primary, secondary and branched chain alkenyl hydrocarbyl groups; and primary, secondary and branched chain alkyl- and alkenyl-substituted phenolic hydrocarbyl groups; said hydrocarbyl groups having a hydrocarbyl chain length of from about 6 to about 20, preferably from about 7 to about 18 carbon atoms. More preferably the hydrocarbyl chain length is from about 8 to about 18 carbon atoms. In the general formula for the ethoxylated nonionic surfactants herein, Y is typically -O-, -C(O)O-, -C(O)N(R)-, or -C(O)N(R)R-, preferably -O-, and in which R^2, and R, when present, have the meanings given herein before, and/or R can be hydrogen, and z is at least about 8, preferably at least about 10-11. Performance and, usually, stability of the softener composition decrease when fewer ethoxylate groups are present.

The nonionic surfactants herein are characterized by an HLB (hydrophilic-lipophilic balance) of from about 7 to about 20, preferably from about 8 to about 15. Of course, by defining R^2 and the number of ethoxylate groups, the HLB of the surfactant is, in general, determined. However, it is to be noted that the nonionic ethoxylated surfactants useful herein, for concentrated liquid compositions, contain relatively long chain R^2 groups and are relatively highly ethoxylated. While shorter alkyl chain surfactants having short ethoxylated groups can possess the requisite HLB, they are not as effective herein.

Nonionic surfactants as the viscosity/dispersability modifiers are preferred over the other modifiers disclosed herein for compositions with higher levels of perfume.

Examples of nonionic surfactants follow. The nonionic surfactants of this invention are not limited to these examples. In the examples, the integer defines the number of ethoxy (EO) groups in the molecule.

<u>(C) Straight-Chain, Primary Alcohol Alkoxylates</u>

The deca-, undeca-, dodeca-, tetradeca-, and pentadecaethoxylates of n-hexadecanol, and n-octadecanol having an HLB within the range recited herein are useful viscosity/dispersability modifiers in the context of this invention. Exemplary ethoxylated primary alcohols useful herein as the viscosity/dispersability modifiers of the compositions are n-C_{18}EO(10), n-C_9EO(11), and n-C_{10}EO(11). The ethoxylates of mixed natural or synthetic alcohols in the "tallow" chain length range are also useful herein. Specific examples of such materials include tallow alcohol-EO(11), tallow alcohol-EO(18), and tallow alcohol -EO(25).

(D) Straight-Chain, Secondary Alcohol Alkoxylates

The deca-, undeca-, dodeca-, tetradeca-, pentadeca-, octadeca-, and nonadeca-ethoxylates of 3-hexadecanol, 2-octadecanol, 4-eicosanol, and 5-eicosanol having and HLB within the range recited herein are useful viscosity/dispersability modifiers in the context of this invention. Exemplary ethoxylated secondary alcohols useful herein as the viscosity/dispersability modifiers of the compositions are: 2-C_{16}EO(11); 2-C_{20}EO(11); and 2 -C_{16}EO(14).

(E) Alkyl Phenol Alkoxylates

As in the case of the alcohol alkoxylates, the hexa- through octadeca-ethoxylates of alkylated phenols, particularly monohydric alkylphenols, having an HLB within the range recited herein are useful as the viscosity/dispersability modifiers of the instant compositions. The hexa- through octadeca-ethoxylates of p-tridecylphenol, m-pentadecylphenol, and the like, are useful herein. Exemplary ethoxylated alkylphenols useful as the viscosity/dispersability modifiers of the mixtures herein are: p-tridecylphenol EO(11) and p-pentadecylphenol EO(18).

As used herein and as generally recognized in the art, a phenylene group in the nonionic formula is the equivalent of an alkylene group containing from 2 to 4 carbon atoms. For present purposes, nonionics containing a phenylene group are considered to contain an equivalent number of carbon atoms calculated as the sum of the carbon atoms in the alkyl group plus about 3.3 carbon atoms for each phenylene group.

(F) Olefinic Alkoxylates

The alkenyl alcohols, both primary and secondary, and alkenyl phenols corresponding to those disclosed immediately hereinabove can be ethoxylated

to an HLB within the range recited herein and used as the viscosity/dispersability modifiers of the instant compositions.

(G) Branched Chain Alkoxylates

Branched chain primary and secondary alcohols which are available from the well-known "OXO" process can be ethoxylated and employed as the viscosity/dispersability modifiers of compositions herein.

The above ethoxylated nonionic surfactants are useful in the present compositions alone or in combination, and the term "nonionic surfactant" encompasses mixed nonionic surface active agents.

(H) Mixtures

The term "mixture" includes the nonionic surfactant and the single-long-chain-alkyl cationic surfactant added to the composition in addition to any monoester present in the DEQA.

Mixtures of the above viscosity/dispersability modifiers are highly desirable. The single long chain cationic surfactant provides improved dispersability and protection for the primary DEQA against anionic surfactants and/or detergent builders that are carried over from the wash solution. The viscosity/dispersability modifiers are present at a level of from about 0.1% to about 30%, preferably from about 0.2% to about 20%, by weight of the composition.

Dye transfer inhibition agents may also be present herein. Generally, such dye transfer inhibiting agents include polyvinyl pyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, manganese phthalocyanine, peroxidases, and mixtures thereof. If used, these agents typically comprise from about 0.01% to about 10% by weight of the composition, preferably from about 0.01% to about 5%, and more preferably from about 0.05% to about 2%. The present invention also may employ as a dye transfer inhibitor a polyvinylpyrrolidone ("PVP") having an average molecular weight of from about 5,000 to about 400,000, preferably from about 5,000 to about 200,000, and more preferably from about 5,000 to about 50,000.

A soil release agent (SRA) may also be present herein as an adjunct material. SRA's typically have hydrophilic segments to hydrophilize the surface of hydrophobic fibers such as polyester and nylon, and hydrophobic segments to deposit upon hydrophobic fibers and remain adhered thereto through completion

of washing and rinsing cycles, thereby serving as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with the SRA to be more easily cleaned in later washing procedures. SRA's can include a variety of charged, e.g., anionic or even cationic species, see U.S. 4,956,447, issued September 11, 1990 to Gosselink, et al., as well as noncharged monomer units, and their structures may be linear, branched or even star-shaped. They may include capping moieties which are especially effective in controlling molecular weight or altering the physical or surface-active properties. Structures and charge distributions may be tailored for application to different fiber or textile types and for varied detergent or detergent additive products. See also, U.S. Patent 4,968,451, issued November 6, 1990 to Scheibel and Gosselink.

Phase stabilizers are also useful herein, in order to prevent phase separation of the compositions herein. For example, a proper blend of nonionic surfactants and cationic surfactants may be incorporated to enhance phase stability. Examples of such a system include the 1:1 mixture of $C_{10}E_{10}$ and n-dodecyl trimethyl ammonium chloride, or the 1:2 mixture of n-$C_{12}E_9$, n-dodecyl dihydroxyethyl monomethyl ammonium methyl sulfate.

Stabilizers may be present in the compositions of the present invention. The term "stabilizer," as used herein, includes antioxidants and reductive agents both of which are well-known in the art. These agents are present at a level of from 0% to about 2%, preferably from about 0.01% to about 0.2%, more preferably from about 0.035% to about 0.1% by weight of the composition for antioxidants, and more preferably from about 0.01% to about 0.2% by weight of the composition for reductive agents. These assure good odor stability under long term storage conditions for the compositions and compounds stored in molten form. The use of antioxidants and reductive agent stabilizers is especially desirable for low scent (low perfume) products.

Other preferred optional ingredients include, but are not limited to, suds suppressors, dye fixing agents, light fading protection agents, oxygen bleach protection agents, fabric softening clay, anti-static agents, other active ingredients, carriers, hydrotropes, processing aids, preservatives, opacifiers, anti-shrinkage agents, anti-wrinkle agents, fabric crisping agents, spotting agents, germicides, fungicides, anti-corrosion agents, cellulases, and the like.

The fabric softening active, solvent, and adjunct materials may be combined by liquid mixing processes known in the art. Preferred equipment

includes a liquid blender or mixer which combines and/or homogenizes the ingredients herein to form the fabric care composition or the concentrated fabric care composition herein. Preferably, the softening actives are firstly mixed with one or more organic solvents and the selected nonionic surfactant to give a free flowing liquid at the desired process temperature, before adding water to provide the best possible dispersion. If desired, the water can be heated to around 60 °C before mixing with the actives for even better dispersion.

Concentrated Fabric Care Composition

In an embodiment of the present invention, a concentrated fabric care composition is provided herein. The ingredients useful in the concentrated fabric care composition are the same as is described above for the fabric care composition, except for one important point. As phase-separation of silicone and oils is less of a problem in a concentrated form, e.g., where one or more silicone/oil stabilizers may be provided, the concentrated fabric care composition may include silicone therein. However, the concentrated fabric care composition remains substantially free of starch.

With respect to the levels of other ingredients, their final levels after dilution to form the fabric care composition should correspond to the levels described above. However, it is recognized herein that slight dilution differences may occur, and active levels resulting from such dilution variations are also included herein. Accordingly, any specific ingredient level in the concentrated fabric care composition may be determined by: starting with the desired level in the (ready-to-use) fabric care composition and multiplying it by the desired dilution factor, to obtain the desired level in the concentrated fabric care composition. The concentrated fabric care composition may then be adjusted, to achieve the desired ingredient levels. Typically, the solvent level of the concentrated fabric care composition is adjusted to compensate for any changes. For example, if the desired fabric softening active level in the fabric care composition is about 0.3% and the dilution factor is about 1:39, then the concentrated fabric care composition should contain about 12% (i.e., 0.3% * 40) fabric softening active.

The concentrated fabric care compositions herein are intended to be diluted by a dilution solvent, at a dilution ratio of from about 1:1 to about 1:100, preferably from about 1:5 to about 1:50, and more preferably from 1:10 to about

1:30. Accordingly, the concentrated fabric care composition contains from about 0.5% to about 75%, preferably from about 2.5% to about 50%, and more preferably from about 5% to about 35% of a fabric softening active by weight of the concentrated fabric care composition. The concentrated fabric care composition also contains a solvent, and the balance adjunct materials.

The dilution solvent may be any of the solvents described above, but is preferably water such as tap water, deionized water, or distilled water. This allows a consumer to dilute the concentrated fabric care composition immediately prior to use.

Silicone is known to provide smooth ironing benefits, lubricity, and shape retention benefits. The silicone which may be present in the concentrated fabric care composition includes, for example, silicone gels, silicone fluids, silicone gum, and cross-linked silicone resins, as well as both linear silicone and branched silicone. Without intending to be limited by theory, it is believed that the silicone useful herein typically forms cross-linked silicon-oxygen, silicon-amine, silicon-epoxy, and/or silicon-carboxy linkages to provide wrinkle-reduction and ironing benefits. Included herein are the curable amine-functional silicones of EP 0 378 871 A2, to Coffindaffer, published on July 25, 1990; and U.S. Patent 4,419,391 to Tanaka et. al., issued December 6, 1983. Such silicones are available from Dow Corning (USA), as Silicone 531 and Silicone 536; General Electric (USA), as SF 1706; and others. Specific examples of a preferred silicone gum includes polydimethylsiloxane (PDMS), poly(dimethylsiloxane methylvinylsiloxane) copolymer, poly(dimethylsiloxane diphenylsiloxane methylvinylsiloxane) copolymer and mixtures thereof. If present, the concentrated fabric care composition described herein, contain by weight of the concentrated fabric care composition, from about 0.1% to about 33%, preferably from about 0.5% to about 20%, and more preferably from about 1% to about 10% silicone.

Method of Use:

As opposed to, for example, rinse-added fabric softening compositions, the fabric care composition described herein is intended to be applied directly onto a fabric, and is preferably used as an ironing composition. Accordingly, an embodiment of the present invention is also directed towards a fabric care method comprising the steps of providing a fabric care composition, applying the

fabric care composition directly onto a fabric, and ironing the fabric. Thus, an embodiment of the fabric care composition as described herein comprises from about 0.01% to about 1%, preferably from about 0.02% to about 0.8%, and more preferably from about 0.04% to about 0.5% of a fabric softening active by weight of the fabric care composition, a solvent, and the balance adjunct materials. This fabric care composition is substantially free of starch, and substantially free of silicone.

In an alternate embodiment of the present invention, a concentrated fabric care composition is useful herein, if diluted and applied directly onto a fabric. Accordingly, the present invention also relates to a fabric care method having the steps of providing a concentrated fabric care composition, providing a dilution solvent, diluting the concentrated fabric care composition with the dilution solvent to form a fabric care composition, applying the fabric care composition directly onto a fabric, and ironing the fabric. The concentrated fabric care composition contains from about 0.5% to about 75%, preferably from about 2.5% to about 50%, and more preferably from about 5% to about 35%, fabric softening active by weight of the concentrated fabric care composition. The concentrated fabric care composition also contains a solvent, and the balance adjunct materials. The concentrated fabric care composition is substantially free of starch. The concentrated fabric care composition is diluted with the dilution solvent at a dilution ratio of from about 1:1 to about 1:100, preferably from about 1:5 to about 1:50, and more preferably from 1:10 to about 1:30, to form the fabric care composition, which is then ready to use. This method may further comprise a step of agitating the fabric care composition via shaking, mixing, etc., in order to homogenize the fabric care composition prior to application directly onto the fabric.

All of the fabric care compositions described herein are intended for applying directly onto fabric, as opposed to typical fabric softener compositions which are applied to the wash cycle, the rinse cycle, or to the drying cycle, and from there onto the fabrics. The present invention is preferably directly applied onto an already-laundered fabric, and then immediately ironed, to provide the most significant benefits described above. Accordingly, in a preferred embodiment, the fabric is subjected to a laundering step prior to applying the fabric care composition. Such a laundering step includes all types of laundering,

preferably, but not limited to, hand washing, machine washing, rinsing, soaking, dryer drying, line drying, dry cleaning, and combinations thereof.

The fabric care composition may be applied directly to the fabric by any method. For example, by pouring, or by an application mechanism. In a highly preferred embodiment, a fabric care kit is provided, wherein the fabric care kit comprises a hollow body member having at least one reservoir, and at least one application mechanism in connected relation to the reservoir. The reservoir contains a fabric care composition as described herein, which comprises from about 0.01% to about 1%, preferably from about 0.02% to about 0.8%, and more preferably from about 0.04% to about 0.5% of a fabric softening active by weight of the fabric care composition, a solvent, and the balance adjunct materials. The fabric care composition is substantially free of starch, and substantially free of silicone.

In an alternate, but highly preferred embodiment, a concentrated fabric care kit is provided, comprising a hollow body member, dilution instructions, application instructions, and ironing instructions. The hollow body member (as described below) having at least one reservoir is provided, containing a concentrated fabric care composition. The concentrated fabric care composition contains from about 0.5% to about 75%, preferably from about 2.5% to about 50%, and more preferably from about 5% to about 35%, of a fabric softening active by weight of the concentrated fabric care composition, a solvent, and the balance adjunct materials. The concentrated fabric softening composition is substantially free of starch. Preferably, a separate spray bottle may also be provided, but is empty until the consumer dilutes the concentrated cleaning composition therein.

The hollow body member useful herein contains at least one reservoir which holds the fabric care composition until it is to be applied onto a fabric. The hollow body member may be any of the ones commonly used for containing, for example, hard surface cleaner compositions. Examples of useful hollow body members such as bottles are those in U.S. Design Pat. Nos.: 244,991, Weekman et al., issued July 12, 1977; and 275,078, Wassergord et al., issued Aug. 14, 1984. The hollow body member is preferably sized and shaped so as to be easily held in the hand. Furthermore, for the sake of convenience, the reservoir should be sized to hold at least enough fabric care composition to effectively treat at least, for example, one average shirt. The reservoir herein preferably

holds from about 25 mL to about 1500 mL, more preferably from about 100 mL to about 1000 mL, and even more preferably from about 200 mL to about 750 mL of fabric care composition.

The application mechanism is in connected relation to the reservoir, such that the fabric care composition may flow from the reservoir to the application mechanism, and from there be applied onto the fabric. The application mechanism preferably provides a measured amount of fabric care composition per application.

The fabric care composition herein is preferably applied directly onto the fabric by spraying via a fine mist. Without intending to be limited by theory, spraying is preferred because it allows neat, convenient, and even application of the fabric care composition directly onto a fabric. Such spraying may be accomplished by use of a propellant, or without a propellant, e.g., via a manual pumping mechanism. Accordingly, in a preferred embodiment, the application mechanism comprises a spraying mechanism. Such a spraying mechanism is typically a pump-type, or trigger-type spraying mechanism. Typical spraying mechanisms are disclosed in U.S. Pat. Nos.: 4,082,223, Nozawa, issued Apr. 4, 1978; 4,161,288, McKinney, issued July 17, 1979; 4558,821, Tada et al., issued Dec. 17, 1985; 4,434,917, Saito et al., issued Mar. 6, 1984; and 4,819,835, Tasaki, issued Apr. 11, 1989. The spraying mechanisms herein are typically those that act upon a discrete amount of the composition itself, typically by means of a piston that displaces the composition and expels the composition through a nozzle to create a spray of thin liquid. Preferred spraying mechanisms provide desirable characteristics such as a uniformly small droplet size, a highly directional spray which does not contaminate the surrounding area, and combinations thereof. Containers commonly known as "spray bottles" are thus preferred herein.

The hollow body member, reservoir, and/or application mechanism may be constructed of any material compatible with the fabric care composition, such as rubber, plastic, glass, metal, and combinations thereof. However, preferred construction materials include rubber and plastic, even more preferably polyethylene, polypropylene, polyvinyl chloride, acrylonitrile-butadiene styrene, polycarbonate, polyethylene terephthalate, and combinations thereof of sufficient rigidity to serve their functions. Preferred construction methods for the hollow body member, reservoir, and/or application mechanism may be formed via

production processes known in the art, such as blow molding, injection molding, injection blow molding, vacuum forming, thermoforming, and combinations thereof.

In a preferred embodiment, the hollow body member further comprises usage instructions thereupon. Such usage instructions may comprise an ironing instruction, such as to: apply the fabric care composition directly to a fabric, preferably by spraying, and then to iron the fabric to reduce wrinkles, soften the fabric, and/or reduce static to provide the consumer preferred in-wear comfort. If a concentrated fabric care composition provided, then such usage instructions may comprise dilution instructions, application instructions, and ironing instructions. For example, such usage instructions may instruct a consumer to form a fabric care composition by diluting the concentrated fabric care composition with a dilution solvent, preferably water, instruct the consumer to apply the fabric care composition to a fabric, and then instruct the consumer to iron the fabric. Therefore, it is highly desirable to have dilution instructions in association with the hollow body member containing the concentrated fabric care composition, and/or a preferred spray container, in order to advise the consumer of the required/preferred dilution ratios described above. If a separate spray bottle is provided, it may be desirable to add indicia that makes proper dilution easier, e.g., "add one cap of the concentrated fabric care composition to the spray container, and fill to the mark (indicia)".

The bottle for the dilutable, concentrated fabric care composition may optionally employ the so called "self-draining cap" that avoids spilling while providing a measure for easy dosage for dilution.

Examples of the invention are set forth hereinafter by way of illustration and are not intended to be in any way limiting of the invention.

EXAMPLE A

A concentrated fabric care kit is provided, containing an empty plastic spray container, and a plastic bottle (i.e., the hollow body member) containing a concentrated fabric care composition. The concentrated fabric care composition is provided according to the following formulations:

TABLE I	Example 1	Example 2	Example 3
DTDMAC* as 85% active in water and isopropanol	6.5	0	0

Ditallow oxy ethyl dimethyl chloride, 80% active in water and ethanol	0	10	0
Dipalmityl ethoxy oxy ethyl mono ethoxyoxyethyl monomethyl ammonium methyl sulfate as 85% active in propylene glycol and water	0	0	14
Neodol® 91-9	0	2	3
1-tallow(amidoethyl)-2-tallowimidazoline	3	0	0
HCl	0.5	0.2	0.2
1,2-hexanediol	0	15	25
solvent, minors, and other adjunct materials balance to 100%	balance **	balance †	balance ‡

All percentages are by weight of the concentrated fabric care composition.

* DTDMAC = Ditallow dimethyl ammonium chloride.

** solvent = deionized water

† solvent = propylene glycol and deionized water.

‡ solvent = glycerol and water

Example 1 is diluted with tap water, at a dilution ratio of about 1:15, is then sprayed directly onto a fabric (50:50 cotton-polyester blend), and is then ironed. Example 2 is diluted with deionized water, at a dilution ratio of about 1:20, is then sprayed directly onto a fabric (50:50 cotton-polyester blend) and is then ironed. Example 3 is diluted with water at a dilution ratio of about 1:25, is then sprayed directly onto a fabric (50:50 cotton-polyester blend) and is then ironed. Examples 1-3 all provided easier ironing, as well as significant wrinkle reduction. Dilution instructions are provided on the plastic bottle containing the concentrated fabric care composition. Ironing instructions are provided on the spray bottle as well as the plastic bottle containing the concentrated fabric care composition. The fabric care compositions described above are substantially free of starch.

EXAMPLE B

Concentrated fabric care compositions of the present invention have the following formulations:

Table II	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Ex. 8	Ex. 9	Ex. 10	Ex. 11
DTDMAC/ MTTMAC* blend, 83% in Isopropanol	10.48	10.48	0	0	0	0	0	10.48
tallow imidazoline ester 100%	0	0	0	22.0	0	0	0	14.0
1-tallow (amidoethyl)-2-tallow imidazoline ester 100%	0	0	9	0	0	0	0	0
1-tallow (amidoethyl)-2-tallow imidazoline 100%	14.3	14.3	0	0	0	0	0	0
Methyl-1-tallow amidoethyl-2-tallow imidazolinium methyl sulfate 90% in isopropanol (VARISOFT® 475)	0	0	0	0	65	0	0	0
Methyl bis(tallow amidoethyl)2-hydroxyethyl ammonium methyl sulfate (VARISOFT® LM-90) 90% active in isopropanol	0	0	0	0	0	40	0	0
MTTMAC as 75% in isopropanol	0	0	0	0	0	40	0	0
Methyl bis(oleylcarboxyethyl) 2-hydroxy ammonium methyl sulfate 90% in isopropanol	0	0	0	0	0	0	35	0
HCl	0.85	0.85	0.97	1.25	0.5	0.5	0.7	0.85
PVP	3.15	0	1.0	8.0	0	0	0	0
Perfume	1.3	1.5	3.0	0.5	1	0.5	0.8	1.0

PDMS emulsion from Dow Corning	0.3	0	0	0	0	0	1	0
Calcium Chloride	trace	trace	trace	trace	0	0	0	trace
KATHON®	trace	trace	trace	trace	0	0	0	trace
Liquitint® Blue 65	trace	trace	0	0	0	0	0	trace
2-2-Ethyl 1,3-hexanediol	15	0	0	0	10	0	0	0
1,2-hexanediol	0	25	12	0	0	0	0	0
2,2,4-Trimethyl 1,3-propanediol	0	0	18	0	10	0	0	0
Solvent, minors, and other adjunct materials balance to 100%	bal.	bal.	bal.	bal.	bal.	bal.	bal.	bal.

All percentages are by weight of the concentrated fabric care composition.

* DTDMAC = Ditallow dimethyl ammonium chloride. MTTMAC = mono tallow trimethyl ammonium chloride.

EXAMPLE C

A fabric care composition of the present invention was provided having the following formulations:

TABLE III	Ex. 12	Ex. 13	Ex. 14	Ex. 15
VARISOFT® 475	0.2	0	0	0
MTTMAC 90% in isopropanol	0.2	0.3	0	0
DTDMAC 70% in water	0.3	0-0.1	0.25	0
Monopalmityl dihydroxyethyl methyl ammonium chloride 40% in water	0	0	0	1
Dobanol $C_{10}E_{10}$	0.5	1	0	2
Alkaquat DMB-451-50	0.1	0	0.1	0.1
1,2-hexanediol	5.0	9.0	0	15
2,2,4-Trimethyl 1,3-propanediol	0	0	8.0	0
Butylated hydroxytoluene	0.1	0.1	0	0.2
Citric acid	0.1	0.2	0.2	0.25
Perfume	0.05	0.1	0.05	0.05
solvent, minors, and other adjunct materials balance to 100%	bal. *	bal. **	bal. †	bal. †

All percentages are by weight of the concentrated fabric care composition.

* solvent = deionized water

** solvent = propylene glycol and water

† solvent = propylene glycol, glycerol and water

The fabric care compositions in Examples 12-15, are substantially free of both starch and silicone. When they are applied directly onto an already washed and dried 100% cotton fabric via spraying from a plastic spray container, and the fabric is ironed, the above compositions provide easier ironing, reduced static, and enhanced softness. As the above compositions are substantially free of starch and silicone, they do not reduce the benefits of previously-used fabric softening actives. Ironing instructions are provided on the spray bottle as well as the plastic bottle containing the fabric care composition.